Passage; Mackay, Popular Delusions; Wingrove Cooke, China and Lower Bengal; Hone's Ancient Mysteries, and a god (S. Edwin Collingwood, Esq.).

Mr. A. Higgins read a paper—*On the Orthographic Projection of the Skull*, of which the following is an abstract.—The paper will appear at length in the *Memoirs*.

After alluding to one of the main obstacles to the progress of craniology, the great difficulty of bringing together such a series of specimens of any particular natural group as would justify general conclusions, the writer proceeded to consider how the scattered specimens preserved in museums might best be rendered generally available for accurate study. He argued that the method of delineation advocated by Professor Lucae in his *Zur Morphologie der Rassenschädel* afforded the best and readiest means yet devised for effecting that desirable object. This method of delineation was the geometrical one, by means of which objects are represented as they actually exist extended in space, so far as this is possible on a plane surface. He exhibited the simple apparatus used by Prof. Lucae and explained how the drawings were taken. The apparatus consisted of a horizontally suspended glass plate, under which the skull was placed, and of an instrument affording a vertical axis of vision moveable upon the plate. The author then replied to the various objections which had been raised to this mode of delineation, the principal one being the assertion that the drawings do not represent things as they appear to the eye and as they alone exist as far as we are concerned. He maintained that they do convey to the mind the same general impressions as an inspection of the solid object, and therefore answer all the purposes of perspective drawings; and that, in addition, they afford a means of comparing contours and of checking measurements such as no other substitute for the skull itself afforded.

The Chairman proposed thanks to the author of the paper, and suggested that the discussion of it should be postponed until the next paper was read, which was on a similar subject. He directed attention to some photographs on the table of the negro boy from Bunu who was exhibited at the former meeting, and especially to three photographs of the boy's hands, which showed, in the opinion of some gentlemen, an approximation to a webbed structure.

Mr. Wesley read a paper—*On the Iconography of the Skull*—which will appear at length in the *Memoirs;* in which he recommended the ordinary perspective method of drawing instead of the geometrical system advocated by Dr. Lucae and Mr. Higgins. He considered that drawings were valuable as standing in the stead of examination of the actual skulls, and that geometrical drawings did not perfectly subserve that end, and, since they do not represent objects as they appear to the eye, are more or less unintelligible. At the same time it did not appear that geometrical drawings would ever supersede tables of measurement. A few remarks followed upon cranial drawings generally—the number of views required, the importance of

uniform positions, etc. The paper concluded by some practical suggestions with regard to the application of photography to craniology.

The CHAIRMAN, in proposing thanks to the author of the paper, said he could not undertake to compare the relative merits of the two systems of delineation described; one of which was adopted by the Germans, and the other had the approval of Professor Huxley, for whom he begged to express the profoundest reverence.

Mr. D. GAY remarked in reference to the objection raised by Mr. Wesley to photographic drawings of the skull, that when the skull is photographed of the full size there is necessarily a great amount of foreshortening, but when the object is placed at a considerable distance there is no inaccuracy in the picture; and then by reversing the instrument a copy can be taken and a picture may be reproduced exactly of the size of life, and perfectly accurate. By that means an outline can be obtained so exact that it will accurately fit when compared with the skull. In reply to a question from the Chairman, Mr. Gay said the photographs of the negro boy were taken by him.

The Rev. D. I. HEATH observed that the papers that had been read described two methods of drawing objects, one of which professed to represent them as they actually are, and the other as they are seen. It appeared to him that something else was wanted. They required a picture which, by the application of certain rules, would enable them to measure the object and ascertain its dimensions. They wanted to know how the various points would look if they were travelling all round the object. If they sliced a skull into fifty slices it was said that the instrument on the table would give accurate representations of the whole, and if it gave ten or twenty different pictures of the same skull with all the plans, that was what was wanted. The orthographic system seemed to him to be the better of the two, for it gave one plan quite accurately without regard to distance, while, according to the other system, the picture of different skulls in order to be accurate must be taken at exactly the same distance from the eye.

Mr. C. CARTER BLAKE said the two excellent papers that had been read were amongst the most important that had been submitted to the Society since its foundation. Mr. Higgins's ingenious arguments had set the orthographic system clearly before them, and he hoped it might be better received here than it had been in Germany. Von Baer had expressed the opinion that "however many measurements may be tabulated they cannot stand in the place of general impressions made by the skull itself examined from various points of view." Professor Busk, the eminent craniologist, adopted the system of perspective drawing by the *camera lucida*. But setting aside the value to be assigned to different authorities on the point, abandoning the *argumentum ad verecundiam* for the *argumentum ad rem*, the question was: is the orthographic system right in itself? He had doubts of it. Professor Lucae, in his work, *Zur Architectur der Rassenschädel*, exhibited drawings taken from that instrument which were of an exceedingly rough character, even apparently inaccurate, and did not

allow of any comparison with the skull. The next paper of Mr. Wesley referred to some points of great philosophic importance with respect to the exact position in which the skull should be placed. He had stated that with one or two exceptions all fixed lines were more or less arbitrary, except a line along the basicranial axis from the foramen magnum to the ethmoid bone. That statement was true in the present state of knowledge—at least in England. Professor Welcker, however, had laid down rules by which this basicranial axis may be roughly estimated on the outside of the skull. He took a line from the tip of the mastoid to the forward part of the external angular process of the frontal, and this roughly corresponded with the basicranial line. Why two lines that had no apparent connection should so frequently agree he could not tell, but as that method afforded the means of attaining a fixed line, it was convenient it should be used. After some further remarks on that part of Mr. Wesley's paper, in which he urged the necessity of having some fixed vertical or base line adopted to regulate the position of the skull when drawn, Mr. Blake proceeded to notice the concluding observations in reference to photography. He thought Mr. Wesley was rather too hard on photographers. All his own experience of photographers, especially those who were members of the Anthropological Society, had shown him that they were able to tell him more about the correct method of representing a skull than he had been able to tell them. But photography was not applicable to that purpose in many instances, for the colour sometimes rendered the delineations obscure. He should have to show, later in the evening, a skull from Louth, which it would be useless to photograph, for the sutures were so faintly marked that they would not be distinguished by that process of drawing. If such a skull was to be illustrated, he should prefer to have it depicted by the simple perspective method of drawing, such as his friend Mr. Wesley had adopted in the delineation of some skulls Mr. Blake had had the honour to describe before the Society.

Mr. H. Brookes said they had had two very able papers read, and some very able speeches about them, but he could not understand from them what the object was they had in view. He wanted to know why, and for what purpose, the skull was to be measured? They had had one or two indications of the right method of measuring, but they should first ascertain why they measured the skull at all. If it were only to obtain so many lengths and dimensions they would be as wise at the end of their investigations as at the beginning. But if they had any definite object they might advance science by adopting the best methods. The only object he could conceive of measurement was to ascertain the contents of the skull, and the condition of those contents relatively to some central point, or to some other skulls. There was no use in blinking the question, that the mere knowledge of anatomy would not give any information as to the uses of the human system. The functions of the brain must be obtained by phrenological observations. They might assist phrenology by these measurements of the skull, but they could not thereby ascertain the formation of the brain. What was wanted was, to ascertain

the functions of the brain, which could not be done by measurements, though such measurements might be useful guides. He should be glad if their anatomical friends would give some information as to the first formation of the skull and the first portions of brain, and of the manner in which those portions are gradually developed in the embryo of man and of various classes of animals. In that way they might obtain knowledge of the functions of the brain, and ascertain the best method of making the measurements of the skull. He considered the base of the cranial cavity to be the only sure line of measurement.

Mr. J. Fred. Collingwood considered the two papers that had been read stamped that meeting as one of the most scientific that the Society had held. He was surprised that any one could cast a doubt on the usefulness of the means of measurement which had been explained by Mr. Higgins. The apparatus exhibited might be in its arrangements elaborate and clumsy, but those details were capable of improvement. It was the principle of the plan they had to consider, and there was, indeed, nothing new in the mode of delineating objects geometrically. The chief objection to Mr. Wesley's method was, that it depended for its accuracy on the skill of the manipulator. What was wanted was, an universally applicable method of drawing the skull so accurately as to form a scientific record of general utility. Mr. Wesley's method was to supplement his drawings by tables of measurements; but the method described by Mr. Higgins dispensed with tables and was of itself sufficient for scientific purposes. The geometrical method could be easily adopted with practice; it was like learning a new language, the value of which when acquired was at once perceived. Having made many drawings on that plan he was astonished that any one conversant with it should put in competition with it a system of perspective representation.

Mr. G. Dibley observed, in reference to the use of measuring skulls, that the general object was to endeavour to ascertain the capacity of the intellect of the individual, and that it was probable the measurement of skulls might confirm the impressions of physiognomy.

Mr. T. V. Robins said his experience of drawing at the Government Schools of Design in Liverpool, where he had taken at least 4000 drawings, induced him to think that an artist could by free hand-drawing give as faithful a representation of a skull as any measurement made by such a machine as that exhibited by Mr. Higgins.

Mr. Conrad Cox observed that the question before the meeting was not the use of drawings of the skull, but how such drawings could be best made; and the question of use need not be entertained at all. The relation between the capacity of the brain and intellectual power was an interesting consideration, but the question was not then before them. There were several other things besides mental capacity to be considered. There were many different kinds of skulls; there were, for instance, the long, the short, the round, and the rafter forms of skull, and the investigation of those different forms was an interesting study, bearing much on the question of race. The

outlines of the other bones were measured, and why should they not measure those of the skull? They were all parts of our body, and it must be taken for granted that if there were use in measuring the bones of the trunk and limbs, there must be use in measuring the skull. The index of mental capacity such measurements afford was only one part of a great subject.

Mr. BOLLAERT agreed in thinking that was not the time to go into the question of the relation between the form of the skull and intellectual capacity. In the work of Morton a multiplicity of reasons was given for measuring skulls. That author had examined them in every possible way, and the conclusion at which he first arrived was, that the greater the quantity of brain the greater the amount of intellect. In the latter stages of his researches he became doubtful on that point, and he then proceeded to study the positions of different portions of the brain. It was a question, however, on which they had a great deal to learn, for phrenologists had yet taught them very little. He trusted the Society would produce men who would go into the subject fully, and that important results would follow their researches.

Dr. LANGDON H. DOWN said it would be a great advantage to have one uniform system of measurement, and he thought the Society were much indebted to the gentlemen who had brought the subject under their consideration. In examining skulls he was of opinion they should not limit attention only to their size. The quality of the brain was of more importance than the quantity. One point had hitherto been overlooked, which was the want of symmetry of the cranium which had been observed in some idiots, one side being different from the other.

Mr. H. BROOKES explained that he did not object to the measurement of the skull, but he thought that there was a necessity that they should in the first instance ascertain the object they had in view; so that in measuring the skull it should be placed in a position likely to elucidate the facts they wanted to obtain.

Mr. A. HIGGINS, in replying to the observations made on his paper, said, that he thought he had by anticipation answered in the main the objections urged by Mr. Wesley against the geometrical system of delineation. There were, however, one or two points upon which he would like to enlarge. He had not claimed for geometrical drawings that they represented objects absolutely as they appear to our eyes—nothing but stereoscopic pictures could do that—but what he did maintain was that they did so nearly, as to answer the purpose which Mr. Wesley had himself asserted to be the chief use of drawings in craniology, namely, to convey to the mind the same general impressions as is gathered from an examination of the solid object. As an additional piece of evidence that geometrical drawings do most effectually subserve this purpose, Mr. Higgins stated that Professor Lucae had had a careful geometrical drawing made of a well-known bust of Sömmering, and had shown it to several artists of eminence, none of whom detected that it was not a perspective drawing. Even the sculptor of the bust confessed that he should not have known that

the drawing was geometrical had he not observed that the base lines of the two visible sides of the lower part of the bust made a continuous straight line instead of forming an angle. Mr. Higgins exhibited this drawing to the meeting, and requested the gentlemen present to judge for themselves. He ventured to say they would agree that there was a vivid reality about the geometrical drawing such as even the perspective one did not exhibit. He proceeded to remark that the affording a general idea of the shape of skulls was after all only a secondary object in geometrical drawings of these objects. That object would be gained almost, though not equally, as well by free-hand drawings. The great value of orthographic projections was that by means of them, and by means of them alone, the curves of the contours of various skulls—curves so varying as to defy any mere mathematical treatment — could be compared with one another with wonderful accuracy. This was a point of great value in the examination of large series of skulls of any particular people, as in this way, not only would the mean form be more readily eliminated, but differences of form could be readily appreciated, which no mere cranioscopy, or system of measurements, however elaborate, could possibly detect. Then, too, although geometrical drawings would not dispense with measurements taken on the skull itself, they afforded a most valuable means of checking them, and indeed many important measurements, for instance, those of the facial angle and facial triangle, were more readily taken on the drawing than on the skull. The value of free-hand drawing, and indeed of all perspective drawings, depended greatly upon the representations being all taken at the same distance from the object; but who should persuade artists to adopt one uniform rule on this subject? The difficulty at once disappeared if the geometrical method were adopted, as in that case it makes not the slightest difference if the plane of the drawing be near or far off from the object. Nearly all the objections to ordinary perspective drawings, applied with at least equal force to those taken with the aid of the camera obscura; to say nothing of the fact that many persons can never succeed in using that instrument. The object was so near to the point of sight as to cause a very appreciable distortion. It was impossible to see anything approaching to the outline of a true median plane of a rounded object when viewing it from a single point at a small distance. This was a fact recognised and allowed for even in the case of the heavenly bodies, vast as is their distance from the observer; and accordingly astronomers in their drawings of sun, moon and larger planets, did now actually adopt the geometrical method of delineation. The plan mentioned by Mr. Gay of taking photographs of an object placed at a considerable distance and afterwards enlarging the image was a very valuable, although not a new one. It was a step towards geometrical delineations which represented an object viewed from a very long distance, in fact, an infinite distance. Mr. Blake had cited one of the highest authorities on such a subject, Von Baer, as disapproving of the geometrical system. If Mr. Blake had not misunderstood Von Baer it was a somewhat singular fact that the magnificent plates of that veteran anatomist's compa-

ratively recently published *Crania Selecta*, were geometrical drawings. He (Mr. Higgins) would also venture to cite the name of Dr. Paul Broca, who had himself designed an instrument for giving projections of the skull, and had ably advocated the importance of such projections in his paper "Sur les projections de la tête." As to the rough character of Lucae's drawings in the *Zur Architectur des Menschenschädel*, it was right to say that they were taken many years ago, before Lucae had invented the instrument which had been exhibited that night. Mr. Collingwood had stated, what no one would more readily allow than Dr. Lucae himself, that the instrument exhibited was capable of improvement; and he (Mr. Higgins) might mention that a most important improvement had recently been suggested to him, which although it would considerably increase the cost, would, he believed, remove all the practical objections which could be urged against the instrument. In reference to the question of Mr. Brookes, as to the object of measuring and drawing skulls, Mr. Higgins remarked that the first stage of every science is the classificatory; that skulls present us with a large series of phenomena, amongst others, diversity of form; and that we must, as a first step towards a knowledge of the cause of such diversities, adopt some means of recording and classifying them. If it be asked why we fix upon the skull for our special study, the answer is that there is no other group of bones in the skeleton which presents the same complexity and consequent capacity for exhibiting varieties of form and structure.

Mr. Wesley briefly replied to some of the remarks on his paper; and, referring to the Neanderthal skull, he observed that some of the misapprehensions respecting the condition of its sutures had been founded on an imperfect photograph sent to England by Dr. Fuhlrott.

At the conclusion of the discussion on the two papers, Dr. G. D. Gibb begged to make a remark on the photographs of the hands of the negro boy from Bunu, which had been exhibited, and which had been stated to show indications of his being web-footed. Dr. Gibb said that the photographs did not show anything of the kind, for the hand was in every respect well formed.

Mr. Higgins said that on examining the hands of the boy it would be seen that the loose skin between the knuckles was further down than is usually the case in the hand of a European.

Mr. C. Carter Blake begged to coincide with Mr. Higgins's statement, and reaffirmed the fact which he had laid before the Society.

Mr. C. Carter Blake then read a paper on *Certain Simious Skulls, with especial reference to a Skull from Louth, in Ireland.* (This paper will appear at length in the *Memoirs*, with illustrations.)

The paper gave a minute description of a skull which had been presented to the museum of the Society by Capt. Montgomery Moore, and which exhibited a condition of the sutures closely resembling the conditions in the skull "No. 1029 of Davis," and the skull from the Neanderthal. The sagittal, coronal, and peri-sphenoid sutures were all more or less closed, probably in early life, and Mr. Blake thought that this premature synostosis had been the cause why the brain,